and Madison, Wis., the rainfall was the least ever reported for October. The snowfall was unusually heavy for the season in central Colorado, southeastern Wyoming, and in Plumas county, Cal., where it exceeded twenty inches, and amounted to twenty-four inches at Summit, Plumas, Co., Cal., and Fort D. A. Russell, Wyo.

Navigation was interrupted or suspended on the upper Mississippi and upper Tennessee rivers on account of low water, and it was reported that low water in the Erie and Welland canals, attributed to continued easterly winds, rendered the passage of boats through those canals dangerous, if not impracticable, during a greater portion of the month. Damaging drought was general throughout Alabama, Louisiana, Michigan, and Minnesota, in east-central Texas, northern South Carolina, northeastern Indiana and Illinois, northern Iowa, and northwestern Ohio and Wisconsin.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for October, 1889, as determined from observations taken daily at 8 a. m. and 8. p m. (75th meridian time), is shown on chart ii by isobars. The difference between the mean pressure for October obtained from observations taken twice daily at the hours named and that determined from hourly observations, varied at the stations named below, as follows: At Washington, D. C., Philadelphia, Pa., New York, N. Y., Boston, Mass., Saint Louis, Mo., and Chicago, Ill., the mean of the 8 a. m. and 8 p. m. observations was higher by .015, .010, .015, .013, .003, and .006, respectively, than the true mean pressure.

For October, 1889, the mean pressure was highest over the lower Missouri and upper Mississippi valleys and the upper lake region, where it was above 30.15, the highest mean reading, 30.21, being noted at La Crosse, Wis. The mean pressure was above 30.00, except on the middle and north Pacific coasts, the western portions of the middle and southern plateau regions, and in the British Possessions west of the one hundred and tenth meridian. The mean pressure was lowest along the extreme north Pacific coast, where it fell to 29.92 at Port Angeles and Fort Canby, Wash., and over the western portion of the southern plateau region, where the lowest mean readings were 29.93 and 29.95, at Yuma, Ariz., and Keeler, Cal., respectively.

Compared with the distribution of mean pressure for September, 1889, an increase in pressure is shown, except on the Pacific coast north of the fortieth parallel and thence eastward over the western part of the northern plateau region, and along the Atlantic coast north of the thirty-fifth parallel. The greatest increase in mean pressure occurred over northern Minnesota and adjoining parts of Ontario and Manitoba, where it exceeded .25, whence it became gradually less marked to the Atlantic, Pacific, and Gulf coasts. The greatest decrease in mean pressure was noted on the immediate north Pacific coast, where it amounted to .15. On the Atlantic coast the greatest decrease in mean pressure was .06, at Yarmouth, N. S. For September, 1889, the mean pressure was highest from Missouri and Arkansas eastward to the Atlantic coast, and from the north Pacific coast eastward over the valleys of the Columbia and Snake rivers, where it rose above 30.05, while for the current month the highest pressure occupies a well-defined area over the north-central part of the country, with included values above 30.15. The area of low pressure in the British Possessions north of Dakota and Montana in the preceding month has disappeared, while within the area of low pressure in the lower Colorado valley there has been an increase of .11 at Yuma, Ariz., and .08, at Keeler, Cal., respectively.

Compared with the normal pressure for October the mean pressure for the current month was above the normal, except from New England and the Saint Lawrence Valley southwestward to the east Gulf coast, along the Pacific coast, and over the northern plateau region. The greatest departures above the normal occurred in the upper lake region, Minnesota, and eastern Dakota, where they varied from .10 to .20. In New Brunswick and Florida the departures above the normal were less than .05. The most marked departures below the normal pressure were noted on the north Pacific coast, where they exceeded .10. Along the immediate Atlantic coast from New England to South Carolina the departures below the normal pressure were more than .05.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In October, 1889, the monthly ranges were greatest from northeastern Michigan eastward to north-central New York, where they equalled or exceeded 1.00, whence they decreased east-southeastward to .80 on the south New England coast; southward to less than .30 over extreme southern Florida; west-southwest to less than .30 in the lower Colorado valley; and westward to less than .60 on the northeastern slope of the Rocky Mountains, from which region they increased to more than .90 on the north Pacific coast. Along the Atlantic coast the monthly ranges varied from .27 at Key West, Fla., to 1.00 at Oswego, N. Y.; between the eighty-second and ninety-second meridians, .41 at Cedar Keys, Fla., to 1.09 at Sault de Ste. Marie, Mich.; between the Mississippi River and the Rocky Mountains, .39 at Galveston, Tex., to .81 at Bismarck, Dak.; in the Rocky Mountain and plateau regions, .29 at Yuma, Ariz., to .95 at Walla Walla, Wash.; on the Pacific coast, .30 at San Diego, Cal., to .98 at Portland and Roseburgh, Oregon, and Fort Canby, Wash.

AREAS OF HIGH PRESSURE.

Seven well-defined areas of high pressure appeared within the limits of the United States during the month of October, four of which were first observed on the Pacific coast, and four areas disappeared on the Atlantic coast. The areas of high pressure reaching to the north of the Rocky Mountains inclined slightly to the north of east until after the centre of greatest pressure had passed the Rocky Mountains, while the general movement of all areas of high pressure to the east of the Rocky Mountains was to the south of east; and the region of greatest frequency of these disturbances included the territory near the ninetieth meridian north of the fortieth parallel, the greatest number passing over the upper lake region.

The following tables exhibit some of the more prominent characteristics of the high areas:

TABLE I.

No.	First observed.			Last observed.		Duration.	Velocity per hr.	Highest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Date.	Station.	Reading.
		°	°	°	°	*Days.*	*Miles.*			*Inches.*
I.....	1	40	99	38	76	2.5	23.0	2	Parkersburgh, W. Va ..	30.24
II.....	1	40	127	33	87	11.0	{*17. 7.	5	Winnipeg, Man.....	30.58
III.....	3	53	102	46	77	1.5	39.0	4	Green Bay, Wis	30.40
IV.....	8	39	127	42	112	3.5	13.0	11	Baker City, Oregon.....	30.34
IVa	12	55	98	42	88	3.5	14.0	14	La Crosse, Wis.....	30.58
IVb.....	14	45	128	31	97	4.5	25.0	17	North Platte, Nebr	30.46
V.....	18	54	117	47	62	6.5	20.0	23	Saugeen, Ont	30.70
VI.....	24	41	117	45	73	6.5	20.0	25	Salt Lake City, Utah ...	30.36
VII.....	30	41	127	47	120	1.5	20.0	31	Baker City, Oregon	30.60
Mean.	....	45	116	41	88	4.6	20.7	....	.....	30.47

*Seventeen miles, rate of progress until the centre reached the south Atlantic states; seven miles, rate of progress thereafter until it disappeared.

TABLE II.

Number.	Maximum abnormal rise in pressure in twelve hours.			Maximum abnormal fall in temperature in twelve hours.			Maximum wind velocity.		
	Amount.	Station.	Date.	Amount.	Station.	Date.	Miles per hour.	Direction.	Date.
	Inch.			°					
I.....	.56	Sault Ste. Marie, Mich	1	21	Saint Paul, Minn....	1	40	nw.	2
II....	.64	Medicine Hat, N.W.T	4	28	Medicine Hat, N.W.T	4	42	n.	7
III...	.50	Minnedosa, N. W. T.	3	21	North Platte, Nebr..	3	38	w.	3
IV...	.34	Red Bluff, Cal	8	18	Red Bluff, Cal.....	8	30	sw.	8, 9
IV*a*..	.30	Qu'Appelle, N. W. T.	12	18	Bismarck, Dak.....	12	56	nc.	13
IV*b*..	.38	Calgary, N. W. T	15	19	Boisé City, Idaho ...	14	34	ne.	17
V.....	.46	Father Point, Quebec	20	25	North Platte, Nebr..	19	42	nc.	24
VI...	.42	Saint Vincent, Minn..	25	17	Cheyenne, Wyo.....	24	46	nw.	24
VII..	.44	Calgary, N. W. T	31	16	Salt Lake City, Utah	30	34	ne.	31

I.—The month opened with an extended area of low pressure covering the northeastern portion of the United States, while a second depression was central north of Montana, and feeble areas of high pressure covered the eastern slope of the Rocky Mountains and the California coast. The general drift to the eastward of these conditions caused the area of high pressure on the eastern slope of the Rocky Mountains to pass over the central valleys during the succeeding forty-eight hours, the pressure increasing slightly during the easterly movement, attended by generally clear weather throughout the eastern portions of the United States. On the morning of the 3d it covered the Atlantic coast, being central over Virginia, and it disappeared during the day in advance of an area of low pressure over the Lake region.

II.—The area of high pressure on the Pacific coast which was observed on the 1st of the month advanced slowly to the northeast, passing over Oregon on the 2d and the Rocky Mountains on the 3d, and by the morning of the 5th it extended over the Northwest and as far eastward as the upper lake region, the pressure having increased decidedly during its easterly movement. After reaching the centre of the continent the direction of movement changed to south, and from the 5th to 8th it passed over the region north of Lake Superior to the lower Ohio valley, with frost as far south as the Gulf States on the night of the 6th, and killing frosts in central Mississippi and North Carolina on the night of the 7th. In its course to the south and east this area was well defined and covered the entire country east of the Rocky Mountains, the pressure diminishing slightly with the southeasterly movement. After the centre reached the lower Ohio valley it passed southeasterly to North Carolina, and thence south and west during the succeeding three days, the pressure decreasing during this interval, and it finally disappeared by gradual decrease of pressure within the limits of the Gulf States on the 12th. This area of high pressure was remarkable from the fact that its movements could be readily traced from the consecutive telegraphic reports from the 1st to the 12th.

III.—While the preceding area of high pressure was central on the Pacific coast number iii appeared north of Manitoba on the 3d; it passed southeasterly over the upper lake region, following quickly the area of low pressure which was in the Saint Lawrence Valley. It passed eastward to that region on the 4th, and disappeared on the same day, unattended by any marked atmospheric disturbance.

IV.—This forms the most noteworthy area of high pressure observed during the month, as it originated on the Pacific coast, and after moving easterly to the north of Minnesota it was re-enforced from the northward by the area of high pressure described as number iv *a*, and the course of direction changed to south, which direction was maintained from the 12th to the 15th, after which a second re-enforcement appeared from the north Pacific, and the centre of greatest pressure was transferred from the Mississippi Valley to Montana, after which the course of movement was to the south over the eastern slope of the Rocky Mountains, the pressure decreasing during the southerly movement, and the area finally disappeared while central over Texas on the 18th. Although this area of high pressure was defined within the limits of observation during ten days, its movements were irregular, and the centres of greatest pressure have been traced as three areas of high pressure and designated as numbers iv, iv *a*, and iv *b* in the tables, numbers iv and iv *a* joining north of Lake Superior, and numbers iv *a* and iv *b* forming a single area central in Montana. In each case before uniting, two well-defined areas of high pressure could be traced upon the weather chart.

V.—Was observed far to the north of Montana on the 18th, and, after remaining almost stationary during twenty-four hours, it passed slowly eastward, the centre of greatest pressure remaining north of and near the boundary of the United States, the pressure increasing at the centre until it exceeded 30.60 over Manitoba on the morning of the 22d, when this area probably covered the north half of the United States. It moved slowly eastward, attended by an area of low pressure which moved eastward at about the same rate from northern Texas to the south Atlantic coast. The area of high pressure passed to the eastward of northern New England on the 24th, and disappeared from the limits of the chart, while the depression to the south passed off the Atlantic coast on the same day, followed by dangerous gales on the Atlantic coast from Hatteras, N. C., to Block Island, R. I.

VI.—This area of high pressure apparently originated over the central plateau region, where it was well defined and central on the morning of the 24th. It moved slowly eastward, increasing in area, and during the next twenty-four hours it covered the entire Rocky Mountain regions, while the pressure at the centre was less than 30.40. It moved easterly to the central valleys where it was central on the 27th, but the pressure at the centre had decreased considerably, and it could be traced only as a ridge of high pressure extending from Lake Superior southward to Texas. After passing to the east of the Mississippi the pressure was increased during the slow easterly movement, and it was apparently re-enforced by the cold air from the Hudson Bay region, which transferred the region of greatest pressure to the upper Saint Lawrence valley, where it remained until the 30th, after which it disappeared owing to the advance of an area of low pressure from the Lake region.

VII.—Was observed on the Pacific coast to the west of California on the morning of the 30th, and after passing slowly to the northeastward, attended by increasing pressure, it was central over Oregon to the east of the Coast Range at the close of the month, at which period the barometer at Baker City, Oregon, was 30.60, while it was above 30.50 in north Dakota.

AREAS OF LOW PRESSURE.

Twelve areas of low pressure have been traced from the regular telegraphic weather reports during the month of October. Four of these disturbances reached the Atlantic coast within the limits of the United States with considerable energy, and four passed eastward over the lower Saint Lawrence valley. Six of these areas developed to the east of the Rocky Mountains within the limits of the United States, and four probably originated on the Pacific coast. While no disturbance passed eastward over the Rocky Mountains within the limits of the United States, five apparently passed eastward to the north of Montana; the direction of movement to the west of the Rocky Mountains being slightly to the north of east, while the movement was to the southeast until after the centre of depression passed to the east of the upper lake region, when the direction of movement was easterly. In two instances there was an abrupt change of direction of movement when the centre of disturbance reached the Atlantic coast.

I.—This disturbance has been partially described in the preceding REVIEW. At the opening of the month it was a well-defined storm, central north of Lake Huron. Strong winds prevailed in the Lake region, and the winds increased in force on the Atlantic coast, becoming dangerous on the New England coast during the 1st. The centre passed to the

lower Saint Lawrence valley where it was central on the morning of the 7th, where this storm apparently developed its greatest energy. It disappeared to the east of the Maritime Provinces during the night of the 7th, followed by westerly gales over the Gulf of Saint Lawrence.

II.—This depression was at no time central within the limits of the United States. An area of low pressure was north of Idaho on the 1st, and the succeeding reports from the 1st to the 4th show that this disturbance moved directly eastward north of and near the boundary line of the United States until the centre of disturbance reached the Saint Lawrence Valley, when it passed eastward over northern New England as a disturbance of slight energy and attended by increasing pressure at the centre. During its easterly movement it was attended by no marked change in the weather conditions, only light showers were reported at the more northerly stations, but winds were strong at lake stations, ranging from twenty-five to thirty-eight miles per hour when the centre of disturbance was north of the lower lake region, attaining a maximum velocity of thirty-six miles per hour on Lake Erie, twenty-eight miles per hour on Lakes Huron and Ontario, and thirty-eight miles per hour on Lake Michigan.

III.—This disturbance was first observed north of Montana on the 3d. It passed quickly eastward to Manitoba and thence southward to the upper lake region, where it was central on the 4th, bounded by an isobar of 30.01. Small areas of high pressure covered the lower lake region and the upper Missouri valley. By the morning of the 5th the decrease of pressure at the centre, and the advance of a high area from the west, had resulted in a great increase of energy of this storm over the Lake region. Although it was attended by very little rain or snow, the winds were strong from the west as the centre passed to the southeast of the lower lake region, when the winds shifted to the north; light snow occurred in the lower lake region on the 6th, and general rains occurred on the Atlantic coast, the precipitation being heavy along the New England coast near the centre of disturbance. In passing over southern New England the pressure decreased rapidly, and it fell to 29.50 at Nantucket, Mass., during the 7th. The barometric gradient at this time was considerable both to the northeast and to the west, and dangerous gales occurred along the coast from Hatteras, N. C., northward to the Maritime Provinces. The centre of disturbance passed rapidly from southern New England northward to Maine, and thence to the lower Saint Lawrence valley, where it was last marked as central on the morning of the 8th, although the pressure remained relatively low in that region until after the 11th.

IV.—This storm approached from the north Pacific and was attended by heavy rains along the Pacific coast as far south as central California on the 7th.. It passed to the east of the coast line near Portland, Oregon, during the 7th, the rains extending to the east as far as the Rocky Mountain stations during the passage of this depression over the Rocky Mountain districts. It was well defined when central north of Montana and to the east of the Rocky Mountains on the 9th and north of Dakota on the 10th, after which it was not possible to trace its movements from the telegraphic reports.

V.—This area of low pressure developed in the upper Mississippi valley during the 11th, and it was preceded by a trough of low pressure which extended to the southwest of the Rio Grande Valley during the 10th, and it was apparently a portion of the area of low pressure previously described as number iv. This storm moved rapidly eastward to the middle Atlantic states, with increasing energy during the movement, and attended by general rains throughout the Northern States. These rains apparently resulted from the continued cold northeasterly winds caused by an extended area of high pressure which covered the territory to the north. After reaching the Atlantic states this storm was apparently retarded, and it developed great energy, causing dangerous gales, especially on the south New England coast, where the maximum velocity reached seventy-six miles from the northeast on the 14th. These dangerous gales continued on the coast as far south as Hatteras, N. C., until the 16th. This storm continued its easterly movement after leaving the Atlantic coast, although marine reports indicate that it was somewhat retarded immediately after leaving the coast line. A continuation of the description of this storm is given under "North Atlantic storms."

VI.—This storm, although not attended by any unusual disturbance within the limits of the United States, is interesting from the fact that it probably originated in southern California, and after passing northeastward over the plateau regions between the 12th and the 15th, it crossed the Rocky Mountains, moving far to the north of Montana and Dakota, and then slowly eastward, its movement being traced from the regular telegraphic reports to the lower Saint Lawrence valley, where it was central on the morning of the 18th. The passage of this storm over the Rocky Mountain region was attended by general rains from Arizona and southern California northward to the British Possessions, and a decided fall in temperature and light frosts in Oregon on the 15th and 16th. Its course east of the Rocky Mountains is only approximately given, owing to the distance of the centre of disturbance from the stations of observation.

VII.—This storm developed in north Dakota on the 18th, where it was central as a feeble disturbance on the morning of that day. It first moved southeasterly to southern Minnesota, and then easterly over Lake Superior to the lower Saint Lawrence valley, where it was central on the morning of the 20th as a disturbance of considerable energy, the barometric gradient being considerable both to the southeast and southwest, the barometer at Father Point, Quebec, being 29.58, while it was 30.16 at Sydney, C. B. I., and 30.10 at Rockliffe, Ont. It probably passed to the northeast of the Maritime Provinces during the 20th, attended by dangerous gales, as the afternoon reports from Anticosti Island, Gulf of Saint Lawrence, indicated a maximum velocity of forty miles per hour from the southwest, and at Block Island, R. I., a current velocity of thirty-two miles per hour from the southwest.

VIII.—This storm developed on the eastern slope of the Rocky Mountains, it being first traced as central in northern Texas on the afternoon of the 21st. The pressure was unusually high from Nova Scotia westward to Montana, and an area of low pressure of considerable energy, attended by rains, extended over the Pacific coast districts. The storm central in Texas moved eastward, extending in an east and west direction during the 22d, passing over the Gulf States to the south of the area of high pressure above referred to which moved eastward with about the same velocity, and when the storm passed off the south Atlantic coast on the 24th, the area of high pressure was central over New England and it extended southwestward to the Gulf States. The northerly gales, which occurred at Atlantic coast stations immediately after this storm passed to the east of the coast line, indicated a great increase in energy after the storm centre passed eastward of the coast line. The 8 a. m. report of the 24th from Hatteras, N. C., showed a maximum velocity of seventy-six miles per hour from the north, with a current velocity of fifty-six miles per hour, the barometer reading 29.78, and at the same report a maximum velocity of twenty-four miles per hour was reported from Sandy Hook, N. J., and Block Island, R. I., the wind reaching forty-eight miles per hour at Block Island, R. I., during the 24th. This storm also passed beyond the limits of the coast, and has been further traced and described as north Atlantic storm number 7.

IX.—This disturbance developed in the upper Missouri valley, within the limits of the stations of observation. It was central in Montana on the 23d, and it followed the general course of the Missouri River during the succeeding twenty-four hours, reaching north Missouri on the afternoon of the 24th, when the disturbance had assumed the form of a barometric trough covering the central valleys. It moved directly eastward during the first twelve hours of the 25th, attended by general rains from the Gulf coast northward over the Mis-

sissippi Valley and Lake region, after which it passed south over the Ohio Valley and Tennessee to central Georgia, from which point it moved north, following the general direction of the coast line from Georgia to Massachusetts. The northeasterly movement of this storm was attended by heavy rains and dangerous gales along the coast. The pressure decreased at the centre of disturbance during its passage over the south and middle Atlantic states, and the storm apparently attained its maximum energy while passing from Virginia to New York. After reaching New England its course apparently changed to the east, and it disappeared on the 29th.

X.—Was central north of Washington on the 27th and moved directly eastward during the 28th and 29th, reaching Manitoba on the latter date, where it disappeared, unattended by any marked change in weather conditions within the limits of the United States.

XI.—This storm apparently developed on the south and east slopes of the Rocky Mountains, and was probably central in east New Mexico on the 27th. It remained almost stationary in this region during the succeeding forty-eight hours, after which it moved slowly to the northeast, passing over the central Mississippi valley during the 30th, causing general rains over the winter wheat states, where rain was much needed, and doubtless improved the condition of that crop. This disturbance could not be traced farther than the southern portion of Michigan, where it was central on the morning of the 1st. The previous reports indicated that the barometric pressure was increasing at the centre, and no trace of this disturbance remained on the afternoon chart of the 31st.

XII.—As in the preceding case, this disturbance apparently developed in eastern New Mexico. It moved southeasterly towards the Texas coast, where it remained at the close of the month. The succeeding history of this storm will be given in the November REVIEW.

The following tables exhibit some of the principal facts regarding these low areas:

TABLE I.

No.	First observed. Date.	First observed. Lat. N.	First observed. Long. W.	Last observed. Lat. N.	Last observed. Long. W.	Duration.	Velocity per hr.	Lowest pressure. Date.	Lowest pressure. Station.	Lowest pressure. Reading.
		°	°	°	°	Days.	Miles.			Inches.
I.....	1	48	76	49	63	1.5	20.0	1	Father Point, Quebec ..	29.38
II.....	1	50	116	47	69	3.0	33.0	1	Swift Current, N. W. T.	29.52
III.....	3	51	111	51	67	4.5	28.0	7	Nantucket, Mass	29.50
IV.....	7	46	126	53	101	3.0	20.0	7	Portland, Oregon	29.50
V.....	11	43	90	39	70	1.5	33.0	12	Baltimore, Md	29.84
VI.....	12	37	121	52	60	5.5	28.0	18	Anticosti Isl., G. of St. L	29.60
VII.....	18	50	102	50	65	2.0	42.0	20	Father Point, Quebec ..	29.58
VIII....	21	36	100	35	73	2.0	40.0	21	Fort Elliott, Tex.....	29.80
IX.....	23	47	107	43	71	5.0	24.0	27	Harrisburg, Pa	29.52
X.....	27	52	121	54	95	2.5	22.0	27	Calgary, N. W. T	29.34
XI.....	27	35	104	42	84	4.0	14.0	28,'9	Fort Elliott, Tex	29.58
XII.....	30	34	105	30	99	1.0	25.0	30	Fort Stanton, N. Mex ..	?29.56
Mean.	....	44	107	45	76	3.0	27.4	....	.....	29.56

TABLE II.

Number.	Maximum abnormal fall in pressure in twelve hours. Amount.	Station.	Date.	Maximum abnormal rise in temperature in twelve hours. Amount.	Station.	Date.	Maximum wind velocity. Miles per hour.	Direction.	Date.
	Inch.			°					
I.....	.34	Yarmouth, N.S.....	1	18	Chatham, N. B	1	36	sw. nw.	*
II....	.38	Qu'Appelle, N.W.T.	1	26	Bismarck, Dak.....	1	56	w.	1
III...	.38	Qu'Appelle, N.W.T..	3	23	La Crosse, Wis.....	4	48	e.	7
IV...	.34	Calgary, N. W. T	7	26	Fort Buford, Dak .. 7 / Bismarck, Dak.... 8		48	w.	7
V....	.18	Washington, D. C....	12	22	La Crosse, Wis.....	11	76	ne.	14
VI...	.30	Anticosti I., G. St. L.	18	20	Minnedosa, N. W. T.	14	38	s.	14
VII..	.44	Rockliffe, Ont	19	26	Sioux City, Iowa	18	40	nw.	20
VIII.	.22	Santa Fé, N. Mex	21	14	Fort Elliott, Tex....	21	76	n.	24
IX...	.36	Wichita, Kans ..... 24 / Block Island, R. I.. 27		15	Wilmington, N. C...	26	52	e.	29
X....	.40	Calgary, N. W. T	27	18	Ft. Assiniboine, Mont	27	40	se.	27
XI...	.26	Fort Elliott, Tex....	27	16	Louisville, Ky.....	30	48	nw.	28
XII..	.28	El Paso, Tex	30	15	Little Rock, Ark....	31	38	se.	31

*1st to 3d.

NORTH ATLANTIC STORMS FOR OCTOBER, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during October, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Nine depressions have been traced for October, 1889, the average number traced for the corresponding month of the last six years being 12.7. The greatest number of depressions traced for October was sixteen, in 1887, and the least number was seven, in 1883. Of the depressions traced for the current month three advanced eastward over, or north of, Newfoundland; three moved eastward from the coast south of New England; one advanced northeastward from the vicinity of western Cuba; one passed northwest from the Windward Islands, and recurved to the northeast near Bermuda; and one apparently originated west of the British Isles. Over the western portion of the ocean severe storms occurred on the 5th, when heavy gales were encountered north and northeast of Bermuda, attending the passage of the depression which had advanced from the Windward Islands; from the 13th to 16th, inclusive, gales of hurricane force were occasioned by a depression which pursued an irregular course off the middle Atlantic coast; and on the 23d and 24th storms of great violence attended a depression which passed off the south Atlantic coast during the 23d. The severest storms of the month over mid-ocean occurred on the 16–17th, when pressure falling below 29.00 (737), and strong to whole gales, attaining hurricane force on the 16th, were reported. Over and near the British Isles the barometer fell rapidly until the 7th, when the readings were below 28.70 (729) over Scotland. On this date a terrific gale prevailed throughout the British Isles. Many shipwrecks were reported and the coasts were strewn with wreckage. In the northern portions of England and Ireland many houses were demolished and numerous trees uprooted. During the 8th there was a decided increase in pressure over Great Britain, followed on the 9th by a marked decrease to below 28.80 (732), after which latter date the barometer continued relatively high until the 18th, when, under the influence of a storm advancing eastward over the Atlantic, there was a decided fall in pressure until the 20th, after which there was a gradual increase until the 24th, when the barometer was above 30.10 (764). On the 29th, 30th, and 31st, a depression over the ocean to the west and northwest caused south to west gales and low pressure over the British Isles. Reports at hand will not admit of definitely locating the tracks of the depressions that occasioned the severe storms over the British Isles during the first decade of the month; they seem to indicate, however, that on the 6th and 7th a depression passed north of Scotland, and on the 8th and 9th a depression moved east of south to the west coast of Scotland; was central north of Ireland on the 10th, and thence moving southeast disappeared east of Great Britain after the 12th.

The movements of areas of high pressure over the north Atlantic during the month were as follows: An extensive area of high pressure occupied the ocean between the tenth and sixty-fifth meridians and south of the fifteenth parallel on the 1st. This area remained over mid-ocean, alternately contracting and extending its longitudinal limits and gradually moving southward, until the 18th, when it disappeared south of the Azores. On this date an area of high pressure moved off the